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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/785,666	02/23/2004	Raymond Lee Lavoie JR.	03012US	2681

61611 7590 02/27/2007

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EXAMINER	
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ART UNIT	PAPER NUMBER
3723	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
2 MONTHS	02/27/2007	PAPER

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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/785,666
Filing Date: February 23, 2004
Appellant(s): LAVOIE ET AL.

Blake T. Biederman
Attorney
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 12/11/2006 appealing from the Office action mailed 8/29/2006.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

US Patent Publication Number 2002/0095872 A1, Tsuchiya et al., 7-2002

US Patent Publication Number 2003/0219982 A1, Kurata et al., 11-2003

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsuchiya et al (Pub. No. 2002/0035872) in view of Kurata (2003/0219982).

3. In reference to claim 1, Tsuchiya discloses a chemical mechanical polishing (CMP) slurry (CMP process commonly used for polishing semiconductor substrates) that comprises a thickener in an amount of 0.001-0.05 wt% (overlaps claimed range) that may be Polyvinylpyrrolidone (PVP), 0.0001-5 wt% (within claimed range) benzotriazole as an (corrosion inhibitor) antioxidant (paragraphs 50 and 51), 0.01-5 wt% (within claimed range) citric acid as a (complexing agent) oxidation aid (paragraphs 44-

48), 0.01-15% (overlapping claimed range) hydrogen peroxide as an oxidizer (paragraphs 30 and 31), and 0.1-50 wt% and more preferably 1-10 wt% silica abrasive, as discussed supra, with a pH in the range of 3-9 or more preferably 4-8 (overlapping claimed range, paragraph 52) but Tsuchiya fails to disclose that the composition also comprises polyvinyl alcohol. Kurata discloses a CMP slurry and teaches that the addition of a water-soluble polymer in combination with a protective film forming agent to provide an etching-suppression effect, which is a desirable trait, and further teaches that the polymer may be polyvinyl alcohol (PVA) in an amount of 0.001 to 0.3 weight% and more preferably in an amount of 0.003 to 0.1 weight% (paragraph 49). Kurata further discloses that the protective film-forming agent may be benzotriazole (paragraph 35). Therefore it would have been obvious to on e of ordinary skill in the art at the time the invention was made to provide the Tsuchiya slurry with 0.001-0.05 wt% PVP as a thickener and to add 0.001-0.3 weight % PVA to the slurry that will react with the benzotriazole to provide an etching-suppression effect, as taught by Kurata. The portion of the claim that discloses that increasing the weight ratio of the PVA to the PVP decreases the polishing removal rate of the non-ferrous interconnect is merely stating an inherent property that is found in the claimed composition and because the combination of the references makes obvious a composition having the claimed elements within the claimed ranges, the composition disclosed in the obvious combination will also inherently exhibit the same property. Therefore, it further would have been inherent that increasing the weight ratio of the PVA and PVP would decrease the removal rate of the semiconductor substrate. The ranges provided are competent

rejections based on MPEP § 2131.03 [R-2] - PRIOR ART WHICH TEACHES A RANGE WITHIN, OVERLAPPING, OR TOUCHING THE CLAIMED RANGE ANTICIPATES IF THE PRIOR ART RANGE DISCLOSES THE CLAIMED RANGE WITH "SUFFICIENT SPECIFICITY".

4. In reference to claim 2, Tsuchiya discloses that the molecular weight of the thickener (PVP) is in the range of 10,000-5,000,000 and more preferably 50,000-2,000,000, which would inherently produce a range of weight average molecular weight that would overlap the claimed range of 1,000 to 250,000 grams per mole.

5. In reference to claim 3, Tsuchiya discloses that the abrasive particles include silica particles (paragraph 27).

6. In reference to claim 4, Kurata discloses that the weight average molecular weight of the thickener (PVA) is in the range of no less than 500 and more preferably no less than 5,000 (paragraph 49), which produces a range of weight average molecular weight that would overlap the claimed range of 1,000-1,000,000 grams per mole. It would have been obvious that the degree of hydrolyzation of the PVA would be at least 20 mole percent because the PVA will be within a fluid mixture comprising a large majority of water (paragraph 26) based on the composition percentages provided for other contents of the slurry.

7. In reference to claim 5, Tsuchiya discloses that the molecular weight of the thickener (PVP) is in the range of 10,000-5,000,000 and more preferably 50,000-2,000,000, which would inherently produce a range of weight average molecular weight that would overlap the claimed range of 1,000-1,000,000 grams per mole.

8. In reference to claim 6, the percentage ranges of PVP (0.001-0.05%) and PVA (0.001-0.3%) that will be present in the slurry, as discussed supra, provide a possible ratio range of 1:300 (.001%PVP:0.3%PVA) to 50:1 (0.05%PVP:0.001%PVA), which overlaps the claimed range (see MPEP § 2131.03 [R-2]).

9. In reference to claim 7, Tsuchiya discloses a polishing composition comprising 0.001-.05 wt% PVP (within claimed range) with a weight average molecular weight of 500 to 5,000 grams per mole (overlaps claimed range), 0.0001-5 wt% (within claimed range) benzotriazole as an (corrosion inhibitor) antioxidant (paragraphs 50 and 51), 0.01-5 wt% (within claimed range) citric acid as a (complexing agent) oxidation aid (paragraphs 44-48), 0.01-15% (overlapping claimed range) hydrogen peroxide as an oxidizer (paragraphs 30 and 31), and 0.1-50 wt% and more preferably 1-10 wt% silica abrasive, as discussed supra, with a pH in the range of 3-9 or more preferably 4-8 (overlapping claimed range, paragraph 52), as discussed supra. Also, as discussed supra, it would have been obvious to include PVA in a range of .001-0.3 weight% (overlapping range) with a weight average molecular weight of 50,000 to 2,000,000 grams per mole (overlaps claimed range) and it would have been inherent that increasing the weight ratio of PVP to PVA will decrease the removal rate, as discussed supra.

15. In reference to claim 8, in view of the obvious alteration to the slurry of Tsuchiya in view of the teachings of Kurata, as discussed supra, it would be obvious to use the modified slurry (of claims 1 or 7) in the method disclosed by Tsuchiya, which provides the steps of applying a polishing composition to a semiconductor substrate and

polishing the semiconductor substrate at a given pad pressure and it again would have been inherent that increasing the weight ratio of PVP to PVA would decrease the removal rate, as discussed supra. Tsuchiya discloses an example wherein the pad pressure is 27.6 kPa but it would have been obvious, through routine experimentation, to one of ordinary skill in the art at the time the invention was made to vary the polishing pad pressure in order to achieve a desired removal rate.

16. In reference to claim 9, it would have been obvious that the variation of the weight ratio of PVP and PVA, pad pressure, polishing speed, and slurry supply rate would be able to provide a removal rate within the range of 150 Angstroms/min or less.

17. In reference to claim 10, Tsuchiya discloses a removal rate of 400-1,500 nm/min, which is equivalent to 4,000-15,000 Angstroms/min, which falls within the claimed range of 150 Angstroms/min or more. It further would have been obvious that the variation of the weight ratio of PVP and PVA, pad pressure, polishing speed, and slurry supply rate would be able to provide a removal rate within the range of 150 Angstroms/min or more.

(10) Response to Argument

The applicant first argues that the combined references fail to establish a prima facie case of obviousness because the Polyvinylpyrrolidone (PVP) id disclosed by Tsuchiya along with several other thickeners that may be used and that none of the Specific Examples disclosed by Tsuchiya actually include PVP. In response, the reference **does** disclose PVP as one thickener that may be included in the polishing slurry. The listing of several other possible thickeners in the Tsuchiya base reference

merely provides several species of the polishing composition wherein the teachings of the Kurata secondary reference, to add PVA to the composition, would have been obvious to apply to any and all of the references disclosed by Tsuchiya.

The applicant also argues that the combined references fail to establish a prima facie case of obviousness because neither Tsuchiya nor Kurata disclose the benefits achieved with a combination of PVA and PVP. The examiner agrees that the references do not specifically disclose the same benefits that the applicant suggests in their specification. However, the Tsuchiya reference does teach specific benefits achieved by using PVP as a thickening agent and Kurata discloses the specific benefits achieved when using PVA in combination with benzotriazole, which is also disclosed in the Tsuchiya reference as **the** preferred antioxidant (paragraph 50, lines 6 and 7), thus providing the motivation to add PVA to the Tsuchiya composition. Therefore, Kurata provides proper motivation to add PVA to the polishing composition disclosed by Tsuchiya and provides reasonable expectation for success.

Additionally, the applicant also argues that the combined references fail to establish a prima facie case of obviousness because the references fail to disclose that increasing the ration of PVA to PVP will decrease the polishing rate. However, this limitation, in claims 1, 7 and 8 is merely stating what will happen **if** the ration of PVA to PVP is increased, thus does not provide any additional structure (claims 1 and 7) or method steps (claim 8) and may not even be considered to be a positive limitation in the claims. Further, the limitation appears to only provide a property of the polishing composition that would also be an **inherent property** of the polishing composition

formed by the obvious combination of Tsuchiya and Kurata, as discussed supra, that has the same components in the same amounts as the applicant's claimed polishing composition.

Finally, the applicant also argues that the combined references fail to establish a prima facie case of obviousness because the applicant believes that the addition of the PVA, as a water-soluble polymer, could destroy the thickener function of the PVP disclosed by Tsuchiya and that this would require readjustment of the concentration to compensate for the PVA. In response, the examiner points out that a **possibility** of a negative effect does not constitute a lack of motivation and that it is clearly obvious that the amount of PVP, as a thickener, may be varied to achieve the desired effects, which is why Tsuchiya discloses a range of amounts of PVA that may be included in the composition.

The applicant also argues that the action applies an inappropriate "obvious to try" standard because the PVA as a thickener, Benzotriazole as a film forming agent and PVA as a water-soluble polymer are each selected from large groups of possible elements. In response, the examiner never used the phrase "obvious to try" in any of the rejections. Additionally, as discussed supra, the PVP is disclosed by Tsuchiya, the base reference, as a possible thickener that may be used, thus providing multiple embodiments, at least one of which having PVP as the thickener, and all of which it would have been obvious to add PVA, as taught by Kurata. The Benzotriazole, among other antioxidants is also disclosed **by Tsuchiya**, and further disclosed as the

preferable antioxidant to be used (paragraph 50, lines 6 and 7), thus disclosing that the composition preferably comprises Benzotriazole. The reference to Benzotriazole as a film-forming agent, as disclosed by Kurata, is merely mentioned in the rejection to support that the advantageous result of providing PVA as a suppressing etching, that is taught by Kurata, will also be provided to the Tsuchiya composition because Kurata specifically discloses that the etching-supression effect of the water soluble polymer (PVA) is achieved by use thereof in combination with the protective film forming agent (paragraph 49, lines 9-11). Finally, the PVA disclosed by Kurata is also disclosed as one of only nine "**especially preferable**" polymers (paragraph 45, lines 28-32), thus teaching that PVA is one of the more effective water-soluble polymers that one of ordinary skill in the art may add to a composition in combination with a film-forming agent, such as Benzotriazole, to provide a desired etching-suppression effect. Therefore, the combination of the claimed elements to arrive at the applicant's claimed invention is clearly disclosed as at least one embodiment of compositions made obvious by the combination of Tsuchiya and Kurata.

Finally, the applicant argues that the combined references teach away from the claimed limitation that increasing the ratio of PVA to PVP will decrease the polishing removal rate because Kurata discloses that a composition having PVA will have a higher removal rate than a composition with no PVA. In response, as discussed supra, the limitation does not actually have any weight in the claims and the combination of Tsuchiya and Kurata does provide a polishing composition having all of elements in the

quantities claimed by the applicant along with meeting all of the additional limitations in that have patentable weight in the claims. Further, as discussed supra, the limitation that increasing the weight ration of PVA to PVP decreases the polishing removal rate is merely disclosing a property of the claimed composition that must be inherent to any composition having the same elements in the quantities claimed, including the composition made obvious by Tsuchiya and Kurata. Additionally, the teaching of Kurata that PVA increases removal rate is only tested in the polishing composition of Kurata, which is different that the polishing composition of Tsuchiya, to which the PVA is added in view of the advantages taught by Kurata. Also, the disclosure of Kurata only shows that a composition having PVA has a higher polishing removal rate than a composition with no PVA but does not show the effects that different amounts of PVA within the composition would have. Therefore, the Kurata disclosure does not effectively disprove that increasing PVA would always increase polishing removal rate. Finally, the applicant addresses the belief that the Kurata reference teaches that an increase in PVA would not decrease the polishing removal rate but an increase in the ratio between PVP and PVA could also include a decrease in PVP, which is not addressed by the applicant as to the effect of decreased PVP on the polishing removal rate. Therefore, it is the view of the examiner that the combination of Tsuchiya and Kurata does not in any way teach away from the applicant's claimed invention.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Bryan R. Muller

2/21/2007

Conferees:

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